ORO-723 (ORGDP)

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RADIOACTIVE WASTE MANAGEMENT PLANS
OAK RIDGE GASEOUS DIFFUSION PLANT

UNITED STATES ATOMIC ENERGY COMMISSION
OAK RIDGE OPERATIONS
OAK RIDGE, TENNESSEE

FOR INTERNAL USE ONLY

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1. PROGRAM ADMINISTRATION

1.1 SITE

The Oak Ridge Gaseous Diffusion Plant of the United States Atomic Energy Commission is a complex of production, research, development, and supporting facilities, distributed over a 640-acre area of Eastern Tennessee.

1.2 OFFICE RESPONSIBLE

The Oak Ridge Operations Office of the Atomic Energy Commission is responsible for the Oak Ridge Gaseous Diffusion Plant.

1.3 CONTRACTOR

The Nuclear Division of Union Carbide Corporation has been responsible for operating the Oak Ridge Gaseous Diffusion Plant since its inception. Present employment is approximately 3600, and the annual payroll is approximately $45,000,000. The primary mission of the plant is the enrichment of uranium hexafluoride in the uranium-235 isotope, with the performance of other atomic energy related activities as required by the Commission. To accomplish these assignments, a physical plant has been constructed at an initial capital cost of about $815,000,000. The principal process facilities are the five gaseous diffusion cascade buildings, portions of which are now in standby. These are supplemented by about 70 support buildings and facilities (decontamination, barrier manufacture, maintenance, supply stores, administration, laboratories, data processing, cafeteria, etc.).

1.4 LEAD RESPONSIBILITY FOR SITE PLANS

Mr. E. H. Hardison of the AEC-ORO Waste Management Branch is assigned the lead role in maintaining an updated site plan.

1.5 SOURCE OF FY 1974 FUNDS FOR WASTE MANAGEMENT

The waste management programs at the Oak Ridge Gaseous Diffusion Plant are interconnected with the normal operation of certain process buildings. There was no funding for specific waste management activities at the site in FY 1974, but the funding was a portion of the budget assigned to the K-311-1 Purge Facility and the K-1420 decontamination and recovery area. The funds are part of the 02 Program. An estimate of the amount of the budget which was applicable to waste management activities would be approximately one percent.

2. DESCRIPTION OF WASTE GENERATING PROCESSES

2.1 NARRATIVE DESCRIPTIONS AND FLOWCHARTS

2.1.1 K-311-1 Purge Facility

Contaminants are continuously removed, or purged, from the process stream by means of the K-311-1 Purge Facility situated flow-wise immediately atop K-29, but geographically in the K-25 Building. The principal contaminants which may leak into the cascade are nitrogen, oxygen, and Freon-114. Considerable details are involved in the present purge system, but the basic flow scheme is as shown in Figure 1.

The Purge Facility is comprised of four low-speed cells and three high-speed cells. One of the high-speed cells is considered as a spare cell since it is not absolutely required to achieve the desired separation of contaminants from the UF_6. The upflow from K-29 is fed into the side of K-311-1 between the second and third low-speed cells. The two low-speed cells and the high-speed cells above this feed point function as enriching cells. The low-speed cells below the feed point function as stripper cells.

The cells in the upper part of the unit utilize high-speed compressors in order to compress and move the very low-density contaminants through an alumina oxide trapping system. The traps adsorb and retain any UF_6. Light gases proceed to the jet exhauster on the purge unit vent stack for disposal to the atmosphere.

Document Nos. K-PC-612 (Secret), K-PC-616, and K-1212 (Special) give more details on the K-311-1 Purge Facility.

2.1.2 K-1420 Building

There are two operations in the K-1420 Building which contribute radioactive waste at the Oak Ridge Gaseous Diffusion Plant: (1) the equipment decontamination operation, and (2) the uranium recovery operation.

The equipment decontamination operation is performed to remove uranium corrosion products and alpha radiation from diffusion plant operating equipment prior to repair in the maintenance shops. Large equipment is disassembled in a floor pan and, along with the smaller items, is conveyed through the acid spray booth.

Small items also can be decontaminated in the floor pan. The uranium-bearing solutions from the decontamination operations are processed through the uranium recovery equipment to effect recovery of the uranium. A holding pond, K-1407-B, receives some uranium-bearing liquid effluents from the recovery and decontamination operations, such as contaminated rinse water, evaporator condensate, and solvent extraction raffinate.

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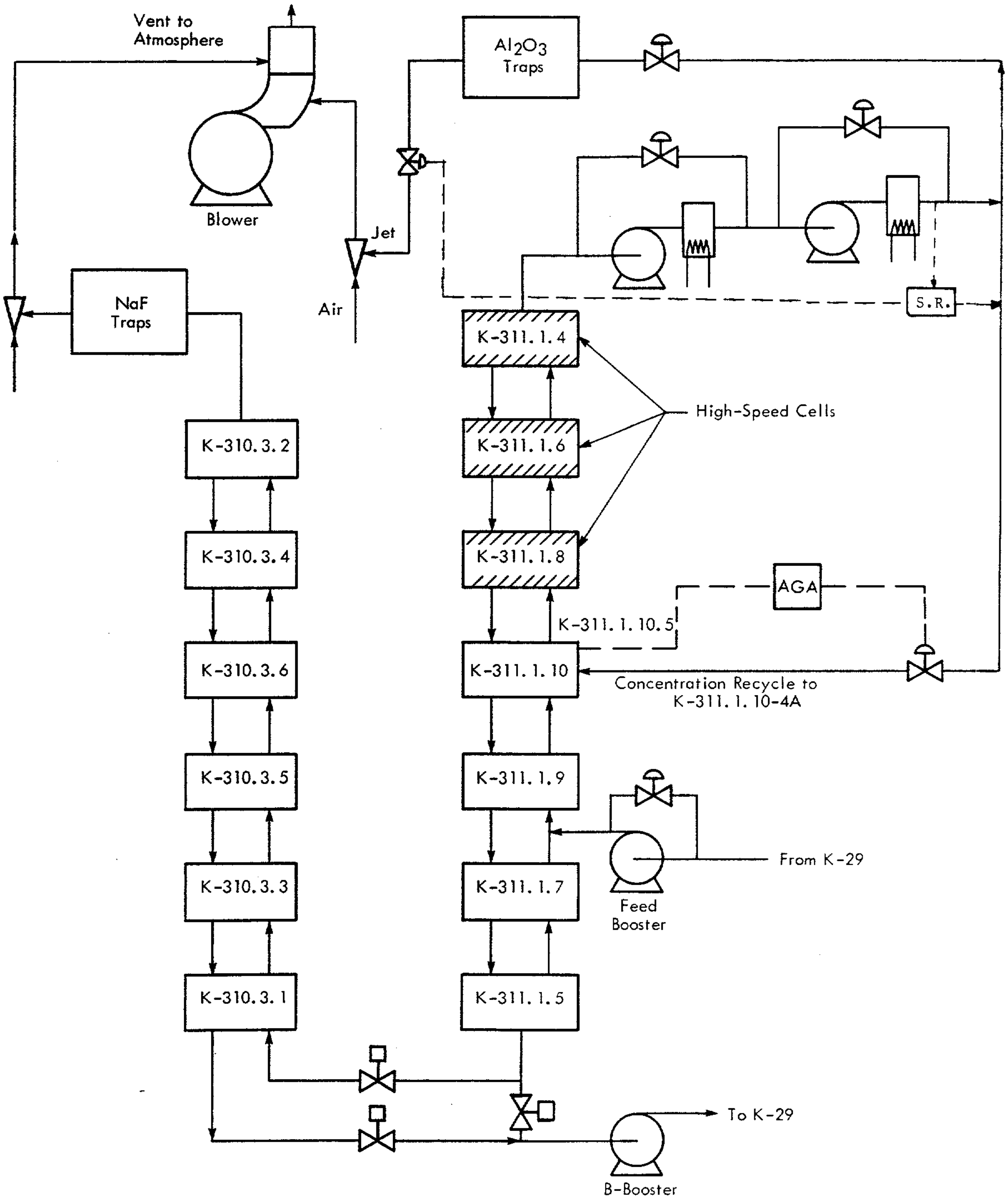

Figure 1

K-311-1 PURGE FACILITY FLOW CHART

The second waste contributing operation, the uranium recovery system, is an operation performed to separate and purify uranium. The recovery facility is actually a liquid extraction operation. There are several drain lines in this operation which flow to the K-1407-B holding pond. However, some of the drains contain no contaminated materials, while the others contain traces of contaminated material.

Figures 2A, 2B, and 2C show the flow through the uranium recovery operation and also show a general sketch of the floor pan and spray booth.

3. DESCRIPTION OF WASTE MANAGEMENT FACILITIES

3.1 IDENTIFICATION AND LOCATION OF FACILITIES

See Figure 3 for the Oak Ridge Gaseous Diffusion Plant Site Map.

3.2 DESCRIPTION OF WASTE TREATMENT FACILITIES

3.2.1 K-311-1 Purge Facility

The purge gases from the K-311-1 Purge Facility may pass through either of two waste treatment facilities, or devices, before being emitted to the environs. The purge gases consist of oxygen, nitrogen, some Freon-114, and minute traces of UF_6. The treatment devices are chemical traps through which the gases pass. The UF_6 is retained in the traps. (See Figure 1 for the flow location of the traps in K-311-1.)

The lighter gases, oxygen and nitrogen, flow through the activated aluminum oxide (Al_2O_3) traps, often referred to as "alumina traps". Figure 4 shows the complete trapping system. The design and efficiency of the alumina traps are such that the concentration of UF_6 leaving the traps is less than one ppm. The purge gas flow is routed to another set of alumina traps if the efficiency of the first set decreases.

The heavier gases, such as Freon-114, flow through sodium fluoride (NaF) traps. Here again, the UF_6 remains in the trap while the other gases pass through and are vented to the atmosphere. The NaF traps can be "regenerated" if their efficiency decreases.

Document Nos. K-PC-612 (Secret), K-PC-616, and K-1212 (Special) give more details about the K-311-1 Purge Facility.

3.2.2 K-4120 Building

There are three waste treatment facilities in the K-1420 Building and another treatment facility, the K-1407-B holding pond, which is directly related to the K-1420 Building.

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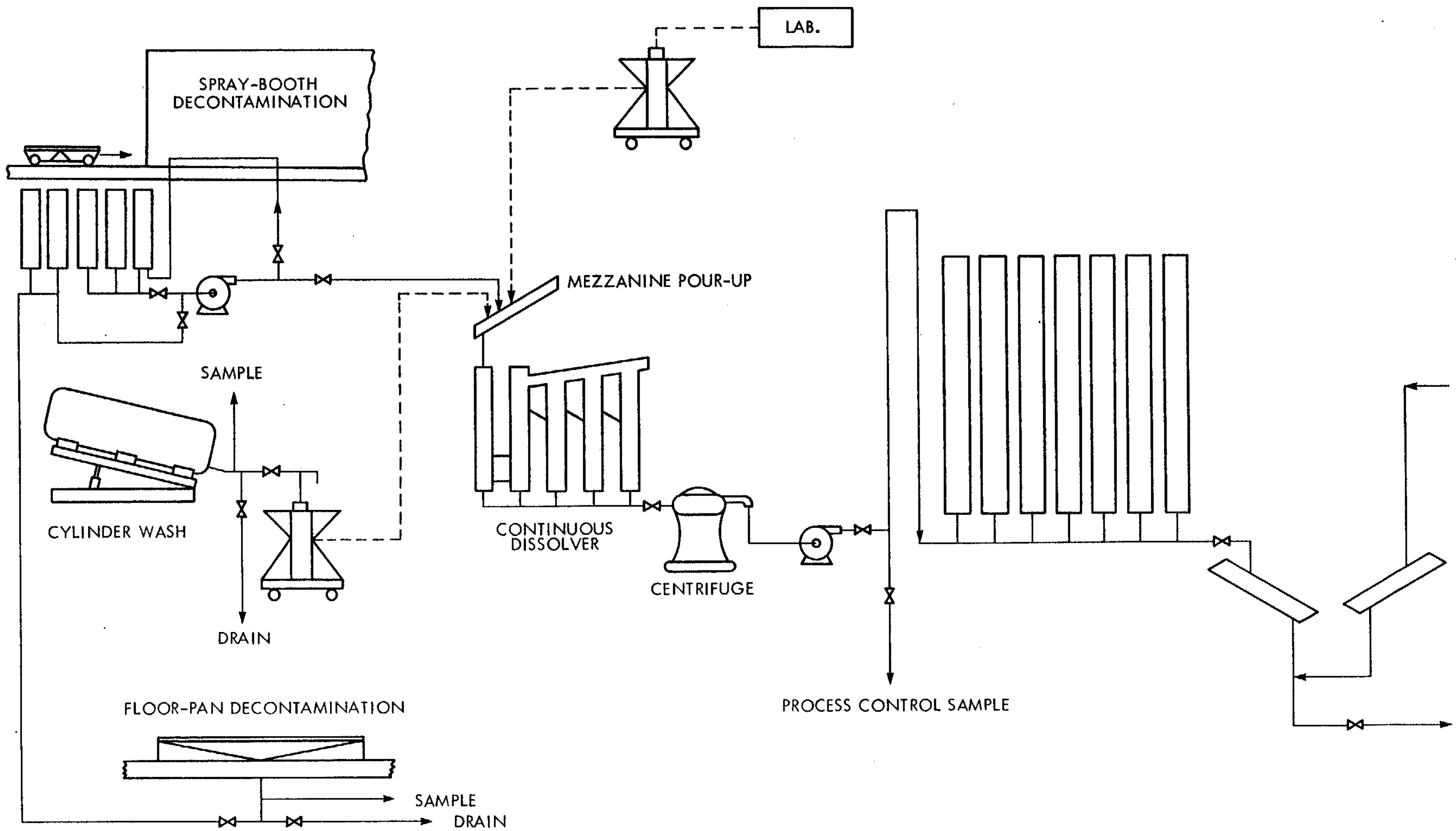

Figure 2A

K-1420 URANIUM DECONTAMINATION AND RECOVERY FLOW CHART

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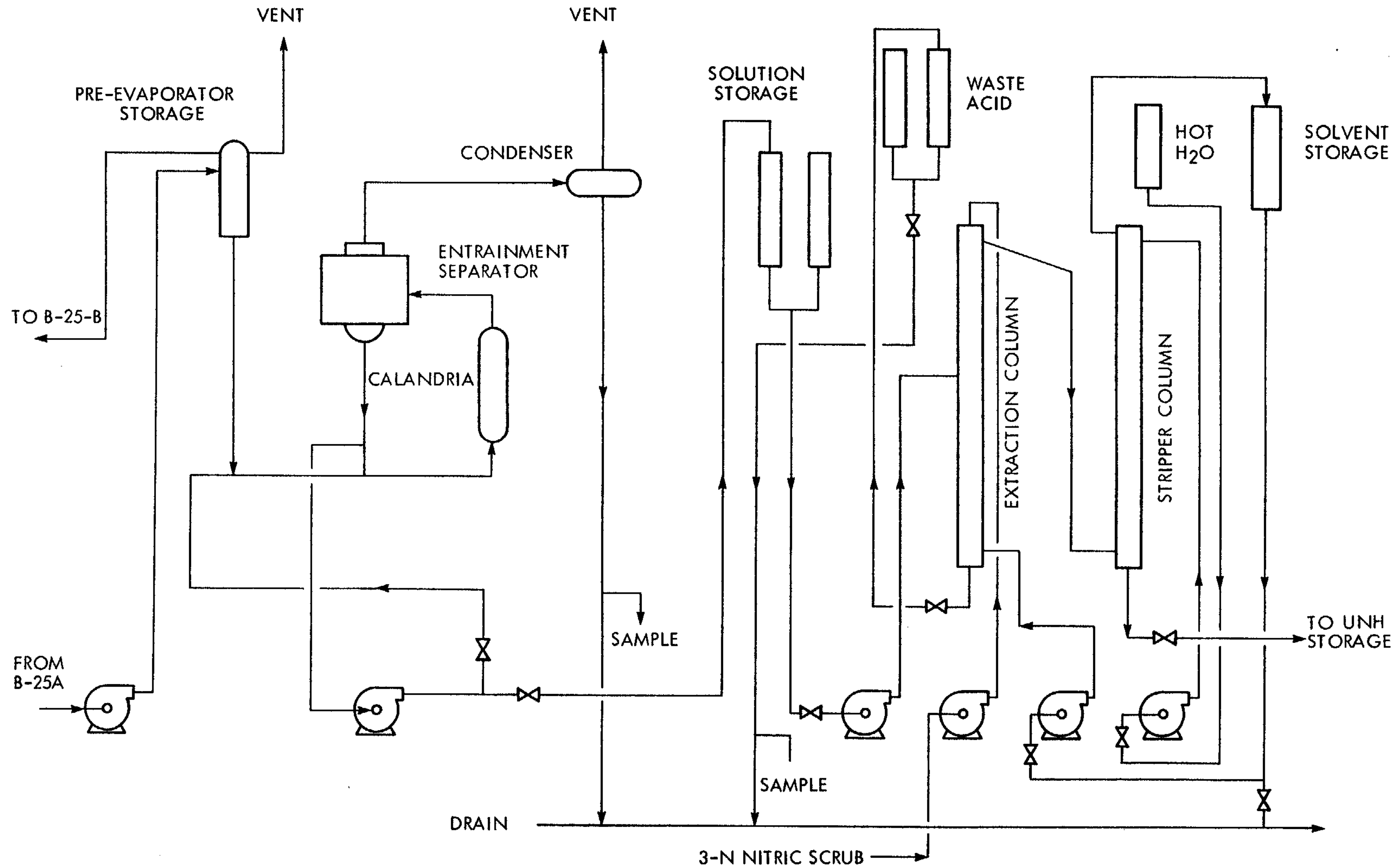

Figure 2B

K-1420 URANIUM DECONTAMINATION AND RECOVERY FLOW CHART

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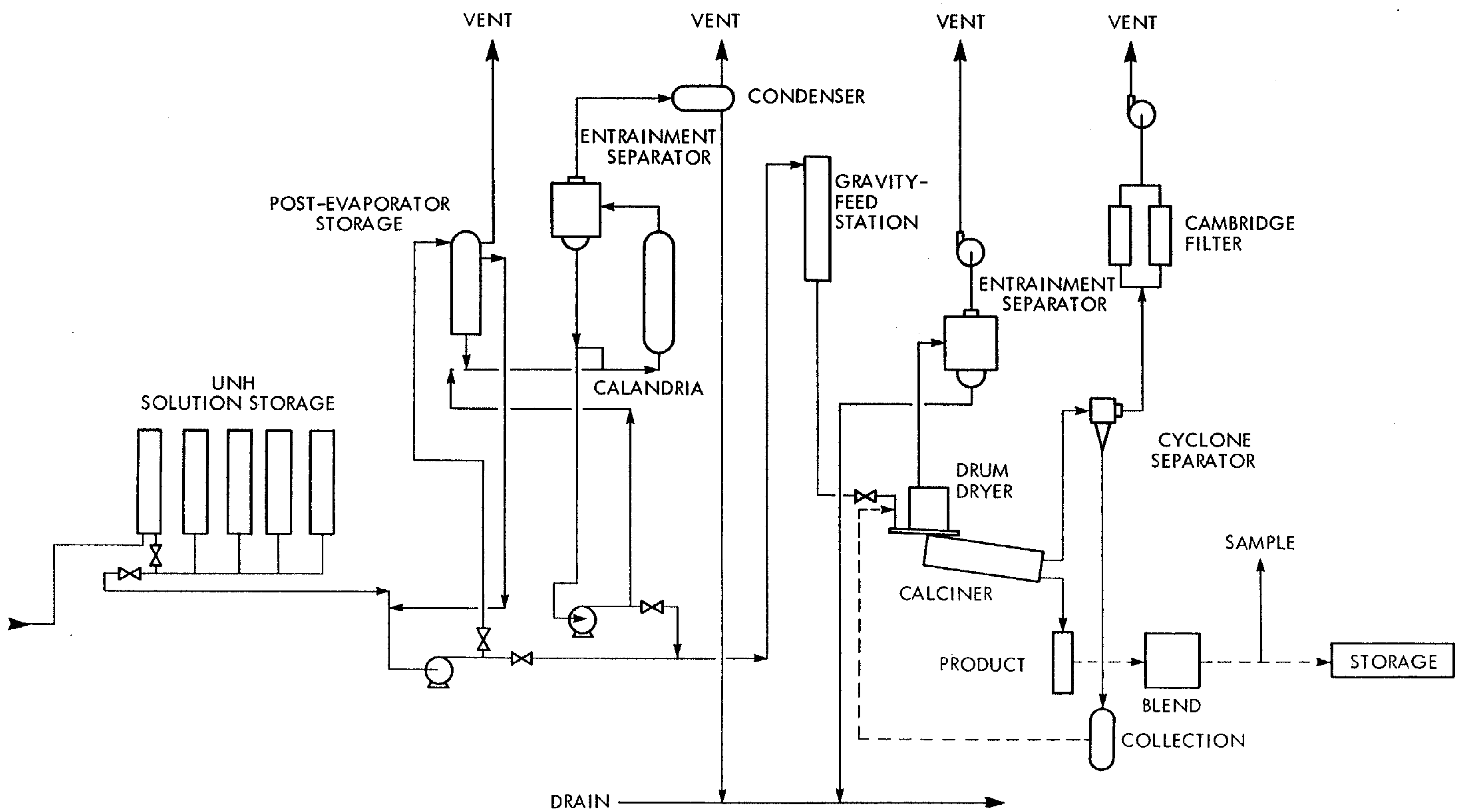

Figure 2C

K-1420 URANIUM DECONTAMINATION AND RECOVERY FLOW CHART

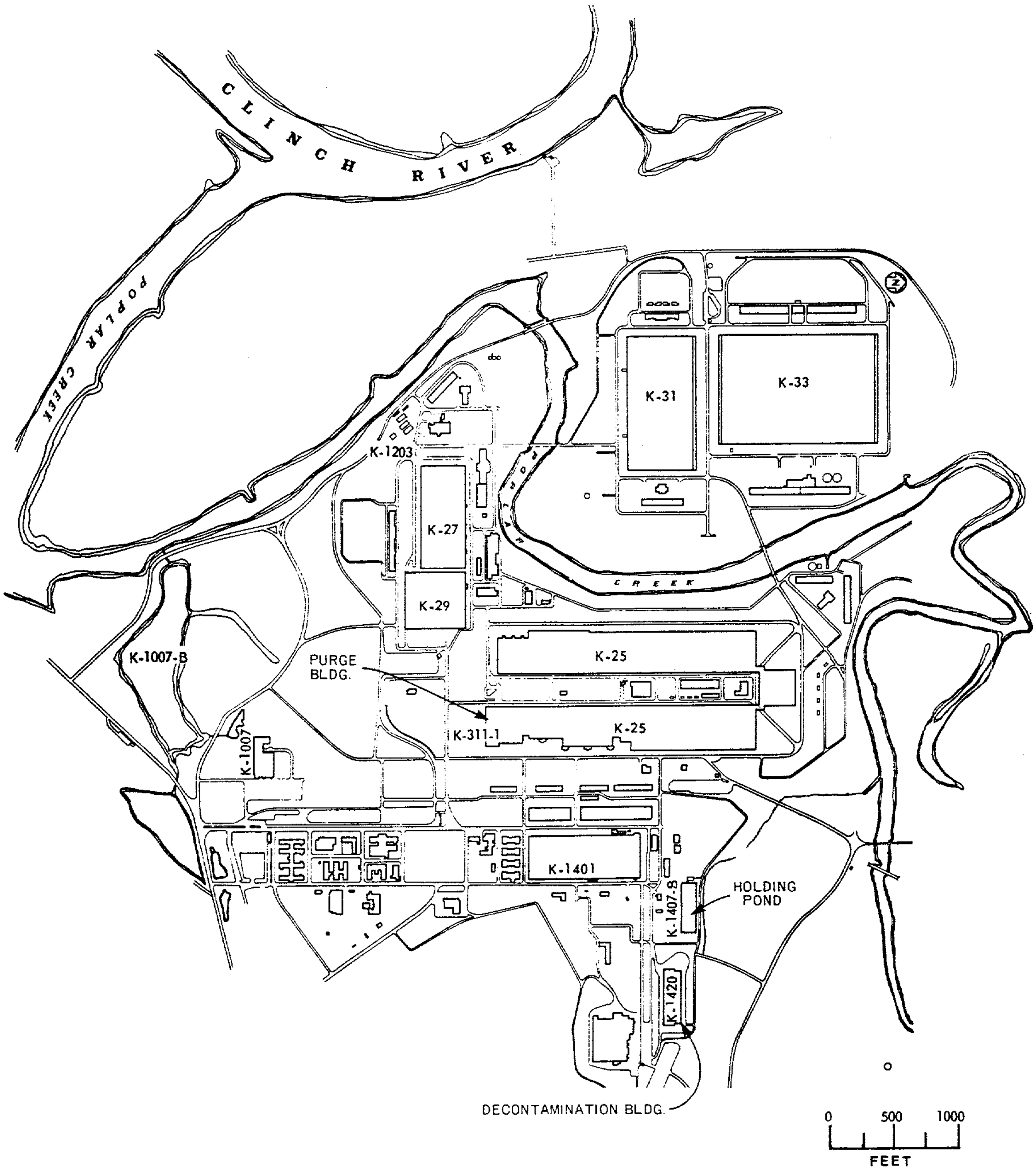

Figure 3

OAK RIDGE GASEOUS DIFFUSION PLANT SITE MAP

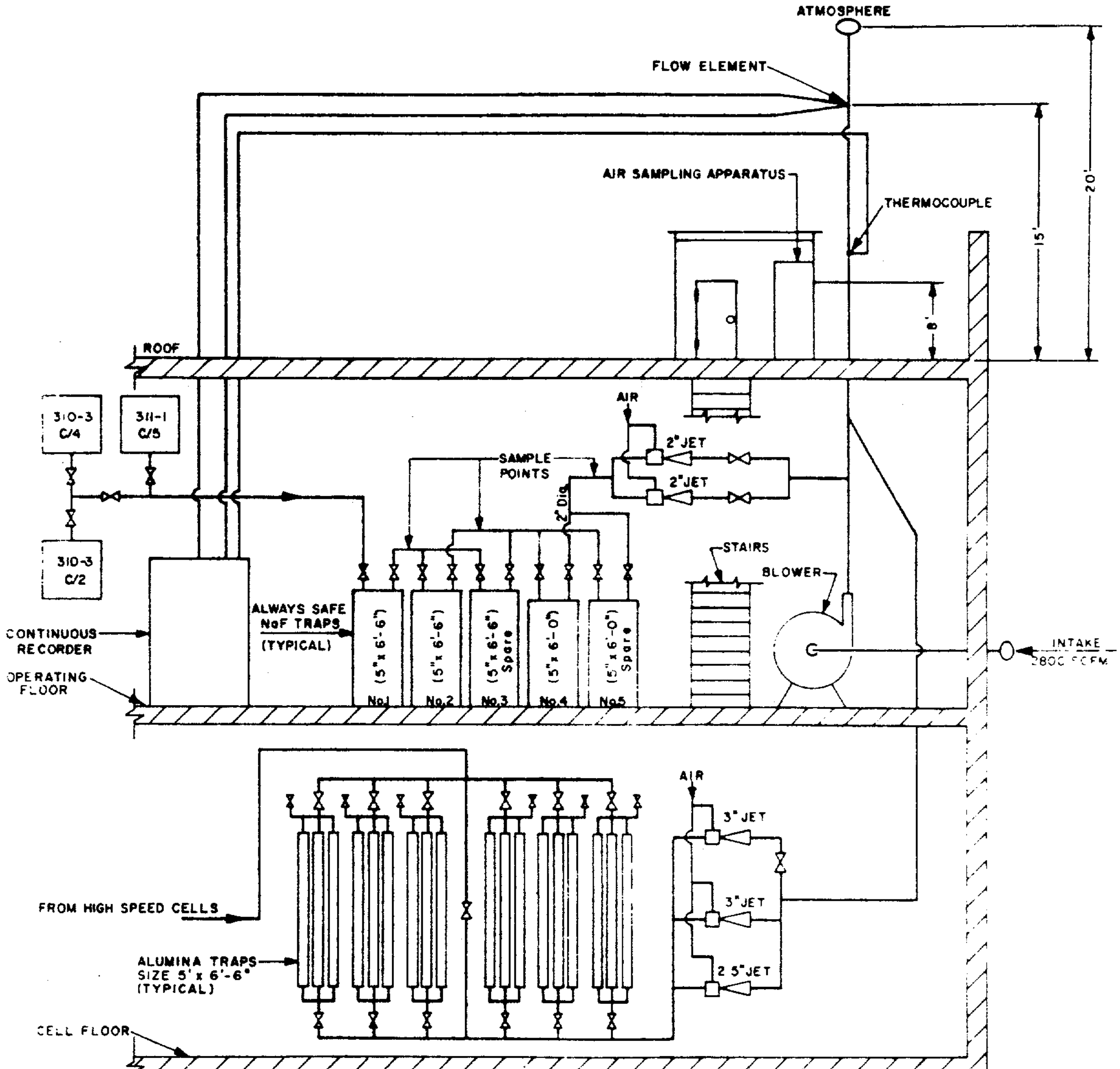

Figure 4
K-311-1 TRAPPING FLOW CHART

(1) Floor Pan Area - Small parts and large equipment, such as compressors, are usually disassembled and taken to the floor pan to be decontaminated. The floor pan is designed especially to support compressor parts during hand decontamination. It consists of a stainless steel pan with a central raised platform for supporting compressor parts and surrounding grids to support personnel. Adjacent utility lines supply air, water, steam, and a mixture of steam and water. Water, steam, acid, or carbonate may be used in conjunction with hand and power tools to scrub, buff, or grind the surfaces free from contamination.

Operators use alpha meters to survey the parts and use an appropriate cleaning method necessary to reduce the alpha contamination on the parts. The liquids used in the cleaning operation flow through drain lines to the K-1407-B holding pond.

(2) Acid Spray Booth - Dismantled converters and compressors and other equipment are decontaminated in the acid spray booth. The equipment is loaded on dollies which can be moved through the spray booth. The booth itself is a long rectangular enclosure.

The equipment is first sprayed with a weak nitric acid solution. After the acid cleaning, the parts are moved to a rinse booth for a water spraying. The water rinse is discharged directly to the K-1407-B holding pond while the acid solution is recirculated. The equipment then moves from the rinse station to the drying booth and is checked with an alpha survey meter.

(3) Uranium Recovery System - The function of the recovery facility is to recover uranium from cleaning and waste solutions containing variable concentrations of impurities. The solutions are derived from the cleaning of process equipment, leaching of alumina that has been removed from traps, lab waste, and cylinder cleaning. The solutions may also contain impurities such as aluminum, calcium, copper, iron, magnesium, tin, manganese, and nickel. Because of the value of enriched uranium and strict considerations for discharges to the environment, the design of the recovery system must provide for rigid accountability, with a minimum practical discard concentration.

The recovery operations are accomplished by a liquid extraction system. This system (Figures 2A, 2B, and 2C) consists of two parallel lines, which include a pre-evaporator, a drum dryer, and a calciner, all interconnected to form a continuous uranium recovery unit. Each line is designed to extract uranyl nitrate from nitric acid waste solutions.

The post-evaporators are designed to increase the uranium concentrations of the extraction column feed solution. A mixer agitated-type extraction column extracts the uranyl nitrate by counter-current flow from the waste solution to meet the uranium discard specification. The contaminated organic solution from the extraction column flows by gravity to a mixer agitated-type counter-current stripper column, where the mass transfer of uranyl nitrate from the organic to the aqueous phase is effected. Uranyl nitrate from the stripper column is pumped to the post-evaporators, where it is concentrated. The evaporator product is fed to a drum dryer to produce dry uranyl nitrate hexahydrate (UNH). This dry material is gravity-fed to a calciner for thermal decomposition to UO_3 and U_3O_8.

The contaminated waste contributed by the uranium recovery system comes from drain lines from condensers and short-term storage areas. (See Figures 2A, 2B, and 2C.) The liquids from the condensers have extremely small or no uranium concentration. The waste nitric acid used in the extraction columns is released to the K-1407-B holding pond whenever its efficiency decreases to a point where a new acid solution would be advantageous. The solvent is treated in a similar manner as the acid.

(4) <u>K-1407-B Holding Pond</u> - The K-1407-B holding pond receives the contaminated waste from the process drain lines connected to the K-1420 Building, as well as some storm drains and other contaminated drains. The pond is physically 390 feet long by 150 feet wide, has an average water depth of 7.0 feet, and an average sludge depth of less than 8 inches. The increased water depth and reduced sludge depth from previous reports is due to the dredging of the pond in March, 1973.

3.3 DESCRIPTION OF WASTE STORAGE FACILITIES

Neither the K-311-1 Purge Facility nor the K-1420 Building has storage facilities that are used to store radioactive waste for a period of one year or more.

One location at the Oak Ridge Gaseous Diffusion Plant where radioactive waste is stored for more than one year is in the radioactive waste burial ground. The burial ground is described further in Section 4.2. Another location is the K-1407-C retention basin. In March, 1973, the sludge was dredged from the K-1407-B holding pond and was pumped to a retention basin designated as K-1407-C. The rectangular basin is approximately 750 feet in length and 70 feet wide, and contains about 5800 cubic yards of sludge. An estimated eight curies of low-assay uranium is in the sludge.

The letter from Mr. A. J. Mallett to the ORGDP Nuclear Safety Committee dated January 17, 1973, entitled, "K-1407-B Holding Pond Sediment Removal," (K-TL-301), gives more information about the dredging operation.

3.4 DESCRIPTION OF EFFLUENT CONTROL SYSTEMS

3.4.1 K-311-1 Purge Facility

The process control instrumentation is designed to automatically control the purge unit at the desired purge rate. Some of the flow is recycled to maintain a 90 percent concentration of light gases between the high- and low-speed cells. This is accomplished by an Acoustical Gas Analyzer (AGA) which provides a continuous measurement, at constant temperature, of the average molecular weight and specific heat ratio of the light contaminant/UF_6 gas mixture as sampled from stage 5 of cell 10.

The pneumatic output of the AGA system operates a control valve in the concentration recycle header to recycle sufficient flow to maintain the concentration at the desired level at the control point (stage 4 of cell 10). Thus, the AGA has first call on the total light gas upflow stream and takes whatever is needed to maintain control. With proper instrumentation set up across the total flow orifice to maintain the desired constant recycle flow, the remaining portion of the total upflow is routed to the atmospheric vent stack. To purge slugs of light contaminants which exceed the limit of the automatic control, it is necessary to open a control valve on the emergency purge system by manually loading air onto the diaphragm of the control valve.

Document Nos. K-PC-612 (Secret), K-PC-616, and K-1212 (Special) give more details of the control systems in the K-311-1 Purge Facility.

3.4.2 K-1420 Building

The control system of the K-1420 Building lies in the sampling procedures for various locations in the decontamination and recovery systems. Figures 2A, 2B, and 2C show several of the sampling locations. The three main locations of concern are (1) from the waste nitric acid, (2) condenser condensate from the uranium recovery system, and (3) the water rinse from the acid spray booth.

As stated previously, the nitric acid solutions are discharged to the K-1407-B holding pond. The solutions are sampled for uranium concentration before being discharged. If the uranium concentrations are acceptable (normally less than five ppm U) the solutions are discharged. Otherwise, the waste acid is routed as a feed to the uranium recovery system.

The water rine from the acid spray booth also is discharged to the K-1407-B holding pond. Sampling has revealed that the uranium concentration in the water discharged to K-1407-B normally is less than five ppm. The liquid stream from the uranium recovery area to the K-1407-B holding pond is discharged in batches. The pre-discharge sampling for uranium concentration provides diversionary capabilities for the K-1420 Building by further recycling.

3.5 SITE ADMINISTRATIVE LIMITS ON EFFLUENTS

The Oak Ridge Gaseous Diffusion Plant has no written site administrative limits on concentration or quantities of contamination in effluents. However, considerable effort is made to be certain that the concentrations or quantities are as low as practicable.

4. RADIOACTIVE WASTES STORED

4.1 HIGH-LEVEL WASTE FROM CHEMICAL PROCESSING OPERATIONS

The Oak Ridge Gaseous Diffusion Plant does not store any type of high-level waste.

4.2 SOLID RADIOACTIVE WASTE OTHER THAN SOLIDIFIED HIGH-LEVEL WASTE

The radioactive wastes stored at the Oak Ridge Gaseous Diffusion Plant applicable to this section are in the contaminated burial ground. Tables 1, 2A, 2B, 2C, and 2D, the AEC Solid Waste Management Questionnaire, show the tabulated experience and estimates related to the burial ground activities. The anticipated period-to-period changes are due to the CIP and CUP programs.

5. PLANS AND BUDGET PROJECTIONS

5.1 INTERIM STORAGE OF HIGH-LEVEL LIQUID WASTE

No high-level wastes are stored at the Oak Ridge Gaseous Diffusion Plant.

5.2 LONG-TERM STORAGE OF HIGH-LEVEL LIQUID WASTE

No high-level wastes are stored at the Oak Ridge Gaseous Diffusion Plant.

5.3 MANAGEMENT OF LOW- AND INTERMEDIATE-LEVEL LIQUID WASTES

5.3.1 Summary and Milestone Charts

The liquid wastes at the Oak Ridge Gaseous Diffusion Plant are all low-level materials. The major source for liquid emissions is the K-1407-B holding pond which receives uranium from the equipment decontamination and the uranium recovery systems in the K-1420 Building. (See Sections 2.1.2, 3.2.2, and 3.4.2 of this report.)

Table 1

PART I

AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

	FY 1973		FY 1974		FY 1975		FY 1976
	July-Dec.	Jan.-June	July-Dec.	Jan.-June	July-Dec.	Jan.-June	
1. Generating Organization							
ORGDP							
2. Generation Rate (ft^3)							
FP/IA Contaminated	-0-	-0-	-0-	-0-	-0-	-0-	-0-
U Contaminated	1000	1000	1000	1000	1200	1200	3000
TRU Contaminated	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Total	1000	1000	1000	1000	1200	1200	3000
3. Volume (ft^3) Treated by							
Compaction Reduction Factor							
Incineration Reduction Factor							
Other (List) Reduction Factor							
Total Input for Volume Reduction	-0-	-0-	-0-	-0-	-0-	-0-	-0-
4. Storage/Burial							
Location ORGDP							
Acreage Utilized	0.003	0.003	0.003	0.003	0.004	.004	0.01
Cumulative	0.128	0.131	0.134	0.137	0.141	0.145	0.155

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AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

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4. Storage/Burial (Cont'd)

	FY 1973 July-Dec.	FY 1973 Jan.-June	FY 1974 July-Dec.	FY 1974 Jan.-June	FY 1975 July-Dec.	FY 1975 Jan.-June	FY 1976
Volume Buried/Stored (ft^3)							
FP/IA Contaminated*	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Cumulative	2434	2434	Same	Same	Same	Same	Same
U Contaminated	1000	1000	1000	1000	1200	1200	3000
Cumulative	34782	35782	36782	37782	38982	40182	43182
TRU Contaminated	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Cumulative	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Total	1000	1000	1000	1000	1200	1200	3000
Cumulative	37216	38216	39216	40216	41416	42616	45616
Total Curies as Buried	0.1	0.1	Same	Same	Same	Same	Same
Cumulative Curies as Buried	13.6	13.7	13.8	13.9	14.0	14.1	14.3
Cumulative Curies with Decay Correction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Estimated Range for Packages							
Gross Beta-Gamma (Curies)	< 0.001		Same		Same		Same
Alpha (Curies)	< 0.001		"		"		"
Radiation Level (mrem/hr)	< 250		"		"		"
Estimated Typical Value for Packages							
Gross Beta-Gamma (Curies)	0.0004		Same		Same		Same
Alpha (Curies)	0.0004		"		"		"
Radiation Level (mrem/hr)	10		"		"		"
Principal Contributors of Activity (Nuclide)	Uranium		Uranium		Uranium		Uranium
Total Pu (g)	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Cumulative	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Total U (kg)	3150	1586	1100	1000	1000	1000	2000
Cumulative	17126	18712	19812	20812	21812	22812	24812

* Material is actually thorium contaminated waste.

AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

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5. Unit Costs ($/ft^3)	FY 1973	FY 1974	FY 1975	FY 1976
For Treated Wastes				
Compaction	N/A	N/A	N/A	N/A
Incineration	N/A	N/A	N/A	N/A
Other Treatment	N/A	N/A	N/A	N/A
For Untreated Wastes				
Packaging and Handling	$ 0.33	$ 0.35	$ 0.36	$ 0.40
For all Solid Wastes				
Freight Shipping Charges	-0-	-0-	-0-	-0-
Storage/Burial	$ 1.10	$ 1.17	$ 1.21	$ 1.32

Fiscal Year 1973

Organization ORGDP

Budget & Reporting Classification

AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

RADIOACTIVE SOLID WASTE OPERATIONS

STORAGE/BURIAL COST ANALYSIS REPORT

Elements	Input (Cubic Feet)	Direct Labor (Man-Years)	Direct Labor ($)	Current Maintenance	Other Direct Costs	Indirect Costs	Technical Support	Total Fund Cost	Depre- ciation	Total Costs
1. Receiving and Handling		0.026	$ 650	-0-					-0-	
2. Monitoring and Measurement		0.003	$ 75	-0-					-0-	
3. Storage or Burial		0.022	$ 550	$ 550					-0-	
4. Environmental Monitoring		-0-	-0-	-0-					-0-	
TOTAL	2000	0.051	$ 1275	$ 550	-0-	$ 240	$ 128	$ 2193	-0-	$ 2193

	Fund	Total
Cost ($) Allocated to Transuranic Waste	-0-	-0-
Cost ($) Allocated to Nontransuranic Waste	$ 2193	$ 2193
Unit Cost ($)/($ft^3$)	$ 1.10	$ 1.10

Fiscal Year 1974

Organization ORGDP

Budget & Reporting Classification ______

AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

RADIOACTIVE SOLID WASTE OPERATIONS

STORAGE/BURIAL COST ANALYSIS REPORT

Elements	Input (Cubic Feet)	Direct Labor (Man-Years)	Direct Labor ($)	Current Maintenance	Other Direct Costs	Indirect Costs	Technical Support	Total Fund Cost	Depre-ciation	Total Costs
1. Receiving and Handling		0.026	$ 690	-0-					-0-	
2. Monitoring and Measurement		0.003	$ 80	-0-					-0-	
3. Storage or Burial		0.022	$ 585	$ 585					-0-	
4. Environmental Monitoring		-0-	-0-	-0-					-0-	
TOTAL	2000	0.051	$ 1355	$ 585	-0-	$ 255	$ 136	$ 2331	-0-	$ 2331

	Fund	Total
Cost ($) Allocated to Transuranic Waste	-0-	-0-
Cost ($) Allocated to Nontransuranic Waste	$ 2331	$ 2331
Unit Cost ($)/($ft^3$)	$ 1.17	$ 1.17

Fiscal Year 1975

Organization ORGDP

Budget & Reporting Classification

AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

RADIOACTIVE SOLID WASTE OPERATIONS

STORAGE/BURIAL COST ANALYSIS REPORT

Elements	Input (Cubic Feet)	Direct Labor (Man-Years)	Direct Labor ($)	Current Maintenance	Other Direct Costs	Indirect Costs	Technical Support	Total Fund Cost	Depre-ciation	Total Costs
1. Receiving and Handling		0.03	$ 842	-0-					-0-	
2. Monitoring and Measurement		0.004	$ 112	-0-					-0-	
3. Storage or Burial		0.026	$ 730	$ 730					-0-	
4. Environmental Monitoring		-0-	-0-	-0-					-0-	
TOTAL	2400	0.06	$ 1684	$ 730	-0-	$ 323	$ 173	$ 2910	-0-	$ 2910

	Fund	Total
Cost ($) Allocated to Transuranic Waste	-0-	-0-
Cost ($) Allocated to Nontransuranic Waste	$ 2910	$ 2910
Unit Cost ($)/($ft^3$)	$ 1.21	$ 1.21

Fiscal Year 1976

Organization ORGDP

Budget & Reporting Classification

AEC SOLID WASTE MANAGEMENT QUESTIONNAIRE

RADIOACTIVE SOLID WASTE OPERATIONS

STORAGE/BURIAL COST ANALYSIS REPORT

Elements	Input (Cubic Feet)	Direct Labor (Man-Years)	Direct Labor ($)	Current Maintenance	Other Direct Costs	Indirect Costs	Technical Support	Total Fund Cost	Depre-ciation	Total Costs
1. Receiving and Handling		0.040	$ 1200	-0-					-0-	
2. Monitoring and Measurement		0.004	$ 120	-0-					-0-	
3. Storage or Burial		0.033	$ 987	$ 987					-0-	
4. Environmental Monitoring		-0-	-0-	-0-					-0-	
TOTAL	3000	0.077	$ 2307	$ 987	-0-	$428	$ 230	$ 3952	-0-	$ 3952

	Fund	Total
Cost ($) Allocated to Transuranic Waste	-0-	-0-
Cost ($) Allocated to Nontransuranic Waste	$ 3952	$ 3952
Unit Cost ($)/($ft^3$)	$ 1.32	$ 1.32

During the Cascade Improvement Program (CIP) and the Cascade Uprating Program (CUP) at the Oak Ridge Gaseous Diffusion Plant, equipment decontamination activities at K-1420 will increase. The present uranium recovery system and decontamination systems at K-1420 will not be suitable to process the increased amount of uranium waste material. Therefore, the existing capabilities will be increased to remedy this situation.

The uranium recovery system and both the floor pan and acid spray booth piping will be revised. (See Table 3 for Milestone Chart.) The uranium-bearing solution handling capacity of the uranium recovery facility will be increased by refurbishing an existing solvent extraction system and a 100-gallon-per-hour steam-heated evaporator. New equipment to concentrate solutions by evaporation will be provided.

The floor pan wash area, which is used to hand decontaminate compressor components and other process equipment, and the acid spray booth used to clean large components now have drain lines which go directly to the K-1407-B holding pond. These drain lines, with the exception of the second water rinse in the spray booth, will be repiped such that the liquids can be processed through the uranium recovery system.

Document No. K-D-2880 (Secret), Design Criteria, Production Support Facilities, Decontamination Building K-1420 (U), Modifications to Existing Building, describes the above-mentioned changes in greater detail.

5.3.2 Expected Accomplishments in FY 1975

A major accomplishment expected in FY 1975 is the initiation of two water monitoring stations on Poplar Creek. One monitoring station will be upstream of the Oak Ridge Gaseous Diffusion Plant and another will be downstream of the plant near the point where Poplar Creek enters the Clinch River. In addition to transmitting and recording such information as pH, total dissolved solids, and dissolved oxygen at the Central Control Room, a water sample will be collected for laboratory analysis for radioactive material. By this method, a surveillance of the quantity and source of the radioactive material can be obtained. Document No. K-D-2869, "Environmental Monitoring, K-25 Area," explains the project in greater detail.

Another accomplishment expected in FY 1975 provides for better pH control of the K-1407-B holding pond. The solubility of the uranium entering the pond is dependent upon the pH of the water in the pond. The solubility of uranium increases in both the extreme values of the acidic and basic pH ranges. The optimum pH value for precipitation of the uranium is near a pH of seven.

Table 3

LIQUID WASTE MANAGEMENT MILESTONE CHART

	FY-72	FY-73	FY-74	FY-75	FY-81
Modification of K-1420 Decontamination Building	1	2 4 3 5	6	7 8	No current plans for this period.
Modification of K-1407-A Neutralization Facility		9	10	11	

1. Title II engineering began.
2. Procurement of equipment began (UCC-ND).
3. Title III engineering began.
4. Equipment modification began (UCC-ND).
5. Construction procurement began.
6. Construction starts (cost-plus-fixed-fee).
7. Equipment modification completed.
8. Construction completed.
9. Title II engineering began.
10. Construction begins.
11. Construction completed.

A project has been initiated to assure that the holding pond is kept near a pH of seven. Presently, there are several uncontaminated streams of both basic and acidic liquid wastes entering the pond. The project calls for the lines to be re-routed to the existing K-1407-A neutralization facility. The liquids will then be neutralized before being pumped to the pond. Automatic chemical feed equipment and pH measuring devices will be installed at the facility.

The project also includes the procurement of a stainless-steel semi-trailer tank-truck to transport the nitrate waste from the K-1420 Building to a new facility to be located at the Oak Ridge Y-12 Plant. The wastes are presently discharged in batches to the holding pond. The proposed method will reduce the pH control problem in the pond as well as eliminate a uranium source.

The same project includes provisions for the acidic run-off from the K-1501 steam plant's coal yard to be routed to the K-1407-A neutralization facility. Since the run-off presently flows to the holding pond, this provision will enable better pH control of the pond.

Document No. Y-EC-154, Conceptual Design Report for Plant Liquid Effluent Pollution Control: Gaseous Diffusion Plants and No. K-D-3148, Design Criteria: Plant Liquid Effluent Pollution Control Facilities, Oak Ridge Gaseous Diffusion Plant For Giffels Associates, Inc. (Project II), describe the above-mentioned project in greater detail.

Other accomplishments will depend upon the route taken in the modification of the K-1420 Building. (See Section 5.3.1 of this report.)

5.3.3 Proposed Program for FY 1976

No specific projects are planned for FY 1976 with the exception of the continuation of the K-1420 modifications and the pH control measures mentioned in Section 5.3.2. (See Table 3 for Milestone Chart.)

5.3.4 Proposed Program for FY 1977 through FY 1981

No proposed projects are planned during this period with the exception of the handling of the increased supply of radioactive material during CIP and CUP as discussed in Section 5.3.1 of this report.

Routine liquid effluent sampling and environmental water monitoring will continue with newer technological methods being applied. Any new standards or regulations will be adhered to as they are issued.

5.3.5 Budget Projections for FY 1976 through FY 1981

The funds for the operation of the K-1420 decontamination facility are part of the uranium recovery funding covered by Activity 02-05.

The proposed modifications and refurbishing of the decontamination and recovery systems in K-1420 have a preliminary cost estimate of $2,600,000. [The cost breakdown is shown in Document No. K-D-2880 (Secret).] Table 4 shows projected costs for these facilities.

Table 4

BUDGET PROJECTION: K-1420 DECONTAMINATION BUILDING*
(Dollars)

	FY-76	FY-77	FY-78	FY-79	FY-80	FY-81
Operating	59,500	62,930	66,300	69,870	60,000	50,000
Equipment**	1,500	500	0	0	0	0

* Estimated costs applicable to radioactive waste management activities.

** Estimated costs applicable to radioactive waste management activities of CIP.

5.4 MANAGEMENT OF SOLID WASTE CONTAMINATED WITH RADIOACTIVITY

The location at the Oak Ridge Gaseous Diffusion Plant which is applicable to this section is the contaminated burial ground. The burial ground, located northwest of the plant, utilizes approximately 0.13 acres of cumulative storage space. The material which is buried is of low assay, usually being less than three percent. All "graves" are identified at the site and permanent records are maintained to identify type, quantity, and activity of all materials which have been buried at this site. Strict adherence is maintained with respect to nuclear safety and AEC burial ground guidelines. Annual reports are submitted to identify the burial activities.

Since the burial ground operation is a routine and simple operation with no significant increase expected in the amount or assay of the material to be buried, no modification, expansion, or construction is proposed within the next ten years. Table 5 shows the projected budget for FY 1976 through FY 1981 (Tables 1 and 2 in Section 4.2 are the AEC Solid Waste Management Questionnaire on the burial ground.)

Table 5

BUDGET PROJECTION: CONTAMINATED BURIAL GROUND*
(Dollars)

	FY-76	FY-77	FY-78	FY-79	FY-80	FY-81
Operating	3952	4190	4440	4710	5000	4900

* Equipment costs are minimal.

5.5 MANAGEMENT OF AIRBORNE RADIOACTIVE WASTE

5.5.1 Summary and Milestone Charts

The K-311-1 Purge Facility at the Oak Ridge Gaseous Diffusion Plant emitted a major portion of the radioactive material released to the atmosphere in CY 1973. The purging is performed to eliminate light gases from the UF_6 gases and, in the process, releases some UF_6. Due to the mechanical condition of the present purge facility, plans are under way to install a new purge facility using FY 1974 capital funds.

Several alternative processes other than gaseous diffusion were considered for purging of diluent gases. For each process, the level of technology, availability for an FY 1974 project, and general economics were considered. Other processes examined were (1) a fluid-bed sodium fluoride system, (2) fixed-bed sodium fluoride traps, and (3) cold traps.

For an FY 1974 project, it was concluded that only gaseous diffusion stages could be considered for use as the purge process. The present plans call for a new purge facility to be installed in K-402-9 (K-27 Building). The planned startup date for K-402-9 is FY 1976. (See Table 6 for Milestone Chart.)

The new purge facility will reduce considerably the amount of radioactive material released to the atmosphere. The reduction will result from newer, more efficient separation equipment, redesigned sodium fluoride and alumina traps, and the addition of a caustic scrubber on the exhaust gas stream. The scrubber, although designed essentially for fluoride removal, will remove almost all of the radioactive emissions from the purge gas stream.

After the new purge facility in K-402-9 is completed, the K-311-1 Purge Facility will no longer be used. Other plans and modifications to K-402-9 after the initial startup will depend upon future performance.

Table 6

AIRBORNE RADIOACTIVE WASTE MANAGEMENT MILESTONE CHART

	FY-73	FY-74	FY-75	FY-76	FY-81
K-402-9 Purge Facility	1	2 3 4 5	6 7	8	No current plans for this period.

1. Conceptual design began.
2. Titles I and II engineering began.
3. Title III engineering.
4. Procurement of equipment and materials started.
5. Removal of equipment and reworking in K-402-9 started.
6. Construction of the K-402-9 Purge Facility starts.
7. Installation of equipment begins.
8. Startup date for the K-402-9 Purge Facility.

Document Nos. K-D-2763 (Secret), K-D-2765 (Secret), and K-D-2770 refer to the new purge facility in more detail.

As stated before, the present purge building contributes almost all of the airborne radioactive material. The other locations, approximately six, which do emit traces of radioactive material will be monitored in the future. If emissions regulations are issued that would include such small amounts, then NaF or Al_2O_3 traps can possibly be installed on the exhaust gas stream.

In all future design, modifications, construction, etc., strict adherence and attention will be given to nuclear safety and AEC regulations.

5.5.2 Expected Accomplishments in FY 1975

No major accomplishment is expected in FY 1975 with the exception of the continuation of the new K-402-9 Purge Facility project. Construction and equipment installation should begin in this time period.

5.5.3 Proposed Program for FY 1976

The new K-402-9 Purge Facility should be in operation in October, 1975. The new facility will be equipped with a caustic scrubber on the exhaust gas stream that will remove almost all of the radioactive emissions from the purge gas stream.

5.5.4 Proposed Program for FY 1977 Through FY 1981

Accomplishments during the period FY 1977 to FY 1981 with respect to airborne waste management will depend upon the performance of the K-402-9 Purge Facility and new regulatory issuances. If more stringent regulations are issued which cite lower radioactive material quantities, NaF or Al_2O_3 traps may be installed on minor effluent sources to meet regulatory limits.

5.5.5 Budget Projections for FY 1976 Through FY 1981

The funds for the purge facilities are part of the cascade funding under Activity 02-05. The proposed new purge facility in K-402-9 will have a total project cost of $5,900,000.

No other plant or capital equipment funds are projected for the present purge facility through FY 1981. Table 7 shows the budget projection for the purge facilities.

5.6 BUDGET PROJECTION SUMMARY FOR FY 1976 THROUGH 1981

Tables 4, 5, and 7 are tabulated summaries of the project budget for the activities related to radioactive waste management.

Table 7

BUDGET PROJECTION: PURGE FACILITIES*
(Dollars)

	FY-76	FY-77	FY-78	FY-79	FY-80	FY-81
Operating	6000	6400	6800	7200	7600	8100
Equipment**	80,000	0	0	0	0	0

* Estimated costs applicable to radioactive waste management activities.

** Portions of the NaF and Al_2O_3 trapping stations and the caustic scrubber in the proposed K-402-9 Purge Facility.

6. DESCRIPTION OF DECONTAMINATION AND DECOMMISSIONING

6.1 IDENTIFICATION AND DESCRIPTION OF RADIOACTIVELY CONTAMINATED FACILITY

6.1.1 Facilities Excess to Present Needs

The Oak Ridge Gaseous Diffusion Plant has no radioactively contaminated facilities which are excess to present needs.

6.1.2 Facilities Expected to Become Excess Within Five Years

The Oak Ridge Gaseous Diffusion Plant does not have any radioactively contaminated facilities which are expected to become excess within five years.

6.1.3 Facilities Currently Considered to be Standby

There are two large process buildings which are currently considered to be standby which are radioactively contaminated. They are the K-25 Building and the K-27 Building. (See Figure 3 for their location.) The K-25 and K-27 Buildings were the first process buildings constructed during the latter part of World War II. The larger building, K-25, is a U-shaped structure about a mile in length and 350 feet in width. Three other buildings, K-29, K-31 and K-33, were constructed in the early 1950s. The K-25 and K-27 Buildings used centrifugal pumps while the newer buildings were equipped with axial flow compressors. The effectiveness and superiority of the axial flow compressors were quickly realized. This realization, coupled with a demand for lower levels of uranium enrichment, was the reason for placing the K-25 and K-27 Buildings in standby. A small portion of the K-25 Building (the K-311-1 section) is still used as a "light-gas" purging facility.

At the present time, the Oak Ridge Gaseous Diffusion Plant does not expect the AEC to change the standby status of the K-25 and K-27 Buildings.

6.1.4 Facilities Currently in Use

The Oak Ridge Gaseous Diffusion Plant does not have any contaminated facilities of which the contaminated portions are currently in use.

6.2 DESCRIPTION OF THE RADIOACTIVITY OF CONTAMINATED FACILITIES

A "low" degree of radioactive contamination exists in the K-25 and K-27 Buildings. Sections of process piping, duct-work, pump parts, and other pieces of equipment have been examined to determine the degree of radioactivity within buildings. Where contamination was present, the radioactivity was due to uranium having an assay of less than five percent U-235. Alpha-meter surveys of the building were also performed and revealed that any radiation was due to low assay uranium.

6.3 IDENTIFICATION OF PRIORITIES

This section does not apply at the Oak Ridge Gaseous Diffusion Plant since it has no excess buildings which are radioactively contaminated.

6.4 OTHER RADIOACTIVE MATERIALS

See response to the letter dated January 18, 1974, J. L. Liverman to field office manager, subject, "Inventory of Quantities and Locations of Radioactivity in the Environment on and Near AEC Sites."